

**State of California
California Department of Fish and Wildlife
North Central Region**

Indian Creek Reservoir, Alpine County

**Summary Report of Roving Creel Surveys (2009, 2011 – 2013) and Angler Survey
Box Analysis (2015 – 2016) at Indian Creek Reservoir, Alpine County**



Ben Ewing

District Fisheries Biologist: Alpine, Amador, Calaveras, and Lake Counties

October 2017

Introduction

Indian Creek Reservoir (ICR) lies approximately three miles north of Markleeville off Highway 89 in eastern Alpine County (Figure 1). Indian Creek Reservoir is located within the East Fork Carson River watershed and was originally constructed between 1968-1970 to store tertiary treated wastewater exported from the Lake Tahoe basin by South Tahoe Public Utility District (STPUD). In 1989, the input of this treated wastewater ceased, but the lake is still a recreational sport-fishing destination due to continued stocking efforts from California Department of Fish and Wildlife (CDFW) and the Alpine County Fish and Game Commission (Alpine County). Indian Creek Reservoir has a maximum estimated depth of 50 feet and sits at an elevation of 5600 feet above mean sea level. In average water years ICR has a capacity of 110 surface acres. ICR has no major natural tributaries, receiving most of its inflow from a diversion from the West Fork Carson River. Indian Creek Reservoir supports various fish species including: non-native rainbow trout (*Oncorhynchus mykiss*, RT) and brown trout (*Salmo trutta*, BN) as well as Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*, LCT) which are native to the eastern Sierra Nevada. Other native fish found in ICR include the Tui chub (*Gila bicolor*), mountain whitefish (*Prosopium williamsoni*), mountain sucker (*Catostomus platyrhynchus*), and the Tahoe sucker (*Catostomus tahoensis*). Brook trout (*Salvelinus fontinalis*, BK) were previously planted at ICR by CDFW, but have not been reported in any field data covering the last six survey years. Largemouth bass (*Micropterus salmoides*, LMB) are also known to occur in ICR.

Methods

In 2016, anglers were asked to complete a voluntary survey form describing their fishing experience at one of the two angler survey boxes (ASB) at ICR. The survey asks anglers for information regarding hours fished, type of gear used, angling method, and the number of landed fish. They were also asked the size and species of the fish landed and whether they kept or released their catch. Finally, anglers were asked three questions, and their answers were recorded on a scale of -2 to 2, with “2” representing most satisfied and “-2” representing least satisfied. The questions pertain to satisfaction of overall angling experience, size, and number of fish. The back of the survey form is reserved for anglers who have any additional comments. The 2009, 2011-2013 data used for comparison in this report were gathered using the roving creel technique in which a CDFW scientific aide would interview anglers about their angling experience (Hood 2013).

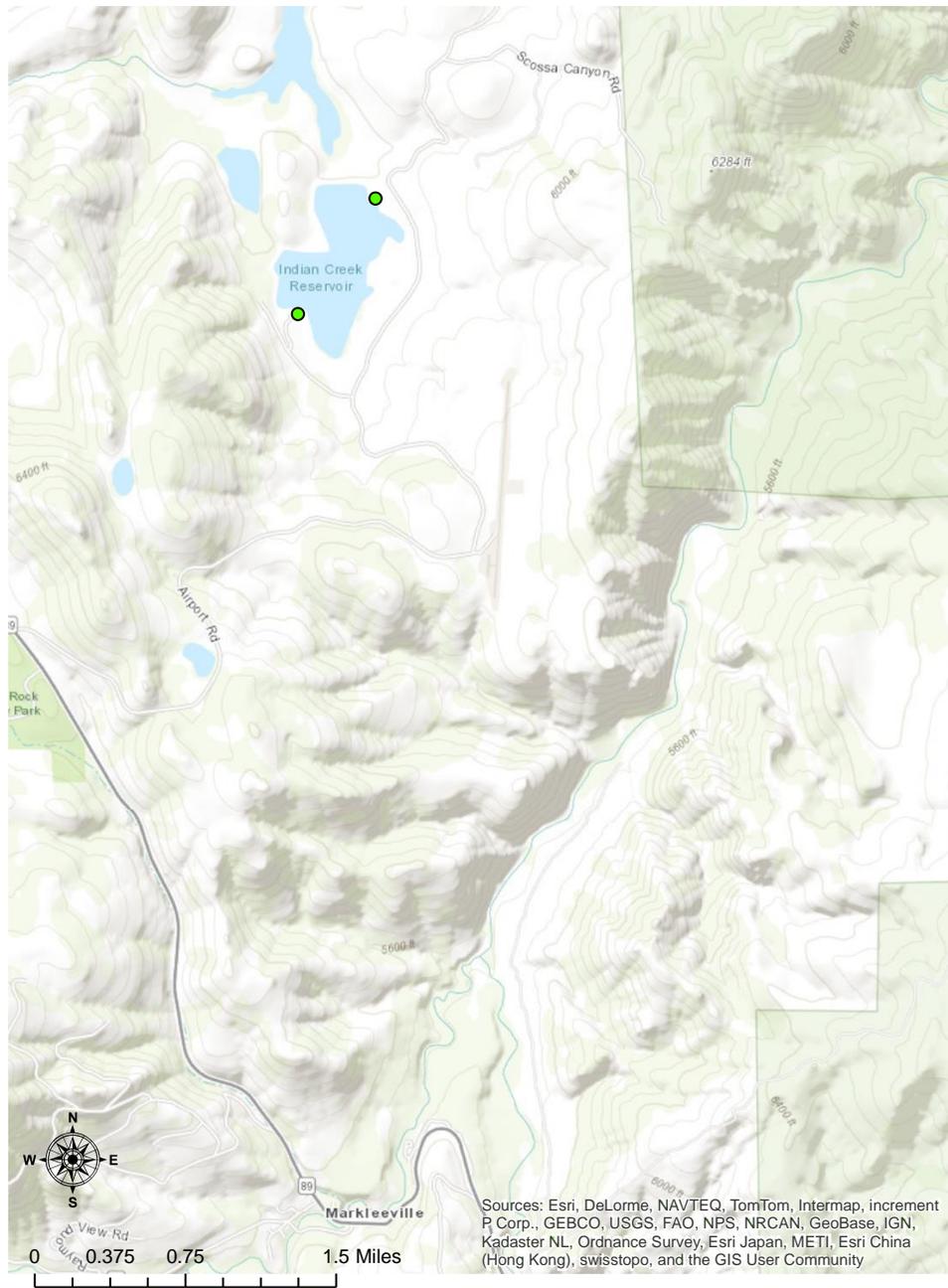


Figure 1. Indian Creek Reservoir, Alpine County, with Angler Survey Box Locations indicated by green dots.

Results

In 2016, a total of 115 anglers responded to the survey. The six-year average, including anglers who responded to the 2009 and 2011 – 2013 roving creel surveys was 82 (Hood 2013) (Table 1). Cumulatively, these anglers landed an average of 171 fish annually and averaged 255.2 hours of fishing (0.57 fish/hour). The catch per angler increased from a 1.10 average prior to 2015, but decreased from the 4.78 catch per angler in 2015 to 2.35 in 2016. Likewise, the catch per hour increased from 0.40 prior to 2015, but decreased from 1.22 in 2015 to 0.62 in 2016, a 49% decrease of fish per hour.

Table 1. Collection of average effort and catch statistics recorded from the roving creel surveys in 2009, 2011-2013, and the 2015- 2016 angler survey box at Indian Creek Reservoir, Alpine County.

Year	Respondents	Hours Fished	Fish Landed	Catch per hour	Catch per angler
2009	143	361.5	242	0.67	1.69
2011	45	134.0	11	0.08	0.24
2012	10	32.5	14	0.43	1.40
2013	98	248.0	103	0.42	1.05
2015	81	318.5	387	1.22	4.78
2016	115	436.5	270	0.62	2.35
Average	82	255.2	171	0.57	1.92

Prior to 2015, the method of take that caught the greatest number of fish was bait (37.8 %) (Table 2). In 2015 and 2016, the method of take that caught the greatest number of fish was flies (49.9 % and 52.2%), which is an increase of 20 % and 24% from the prior years. The method that caught the least percentage of trout in 2016 and prior years was multiple methods (2.2 %), respectively.

Table 2. The number of trout landed by the type of gear from 2009, 2011 - 2013, and 2015 - 2016.

Angling method	Number of Trout		
	2009, 2011 - 2013	2015	2016
Bait	140 (37.8%)	153 (39.5%)	96 (35.6%)
Lure	17 (4.6%)	5 (1.3%)	8 (3.0%)
Fly	107 (28.9%)	193 (49.9%)	141 (52.2%)
Multiple	106 (28.6%)	15 (3.9%)	6 (2.2%)
Not recorded	0	21 (5.4%)	19 (7.0%)
Total	370	387	270

In 2016, anglers managed to catch less trout (n=270) than in 2015 (n=387). Prior to 2015, 89% of trout landed were RT, 6% were LCT, and 5% were BN, respectively. In 2015, anglers reported that 43% were RT, 55% of trout landed were LCT, 2% were BN, and less than 1% were reported as unidentified trout (Table 3). In 2016, anglers reported that 81% of trout landed were RT, 18% were LCT, 1% were BN, and less than 1% were reported as unidentified trout. The reported catch rates correspond with CDFW and Alpine County stocking records as 5,180 lbs. of RT were planted in ICR in 2015 compared to 374 lbs. of LCT (Table 4).

Table 3. Data on kept and released trout at Indian Creek Reservoir in 2009, 2011-2013, and 2015 - 2016.

Year	Species	Kept	Released	Kept/Released	Total caught	Percent of total catch	Percent released
2009, 2011 - 2013	BN	7	10	NA	17	4.6%	58.8%
	LCT	8	14	NA	22	5.9%	63.6%
	RT	136	193	NA	329	88.9%	58.7%
	Unknown	0	2	NA	2	0.5%	100.0%
		151	219		370		
2015	BN	6	2	NA	8	2.1%	25.0%
	LCT	52	160	NA	212	54.8%	75.5%
	RT	95	71	NA	166	42.9%	42.8%
	Unknown*	0	1	NA	1	0.3%	100.0%
		153	234		387		
2016	BN	2	0	NA	2	0.7%	0.0%
	LCT	4	45	NA	49	18.1%	91.8%
	RT	76	141	1	218	80.7%	65.0%
	Unknown	0	1	NA	1	0.4%	100.0%
		82	187	1	270		

*Unknown trout species

Table 4. CDFW and Alpine County stocking events from 2009 - 2016.

CDFW						Alpine County	
RT			LCT			RT	
Year	lbs.	Number	Year	lbs.	Number	Year	lbs.
2016	0	0	2016	320	4192	2016	3600
				605	242		
				145	58		
2015	580	1508	2015	174	87	2015	3600
	1000	1500		200	100	2014	3600
2014	1600	3040	2014	600	300	2013	3600
2013	1220	2806		71.1	1209	2012	2800
	610	2013		2200	6160	2011	4950
2012	317.5	6000	2013	300	150	2010	3800
	2000	6000		300	150	2010*	1000
	625	2000		1376	14998	2009	16800
2011	674	5999	2012	1149	9996	2009*	2200
	1000	2000		220	110		
	3000	5400		380	190		
2010	1000	1500	2011	300	150		
	970	6014		300	150		
2009	599.7	4618	2010	600	300		
			2009	300	200		
	15196.2	50398	16100	9540.1	38742		45950

*Denotes brown trout plant

The 2016 ASB data showed that the greatest percentage (32%) of landed RT (n = 69) measured were in the 12.0 – 13.9 in. length class (Figure 2). For LCT, 43% (n = 21) of the landed and measured fish were in the 16.0 – 17.9 in. length class. For BN, 100% (n = 1) of the landed and measured fish was in the 14.0 – 15.9 in. length class.

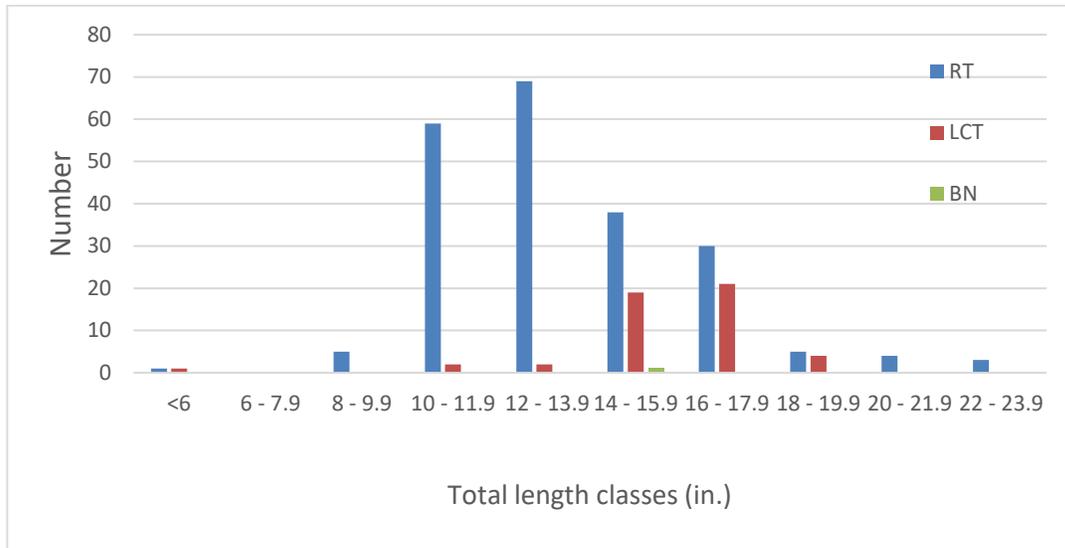


Figure 2. Frequency of identified trout in each size class that anglers reported landing at Indian Creek Reservoir in 2016.

The 2009 and 2011-2013 creel data showed that although more RT had been caught than any other species, a majority of trout caught were released, and the percentages of released trout were similar for all three species (varying between 59 and 64%; Table 3). The majority of all trout species caught were released during this same time frame. In 2015, ASB data showed that LCT were caught in the greatest numbers but of the 212 caught, 75.5% were released. The majority of BN and RT caught were kept compared to previous data from the creel surveys. In 2016, ASB data showed that RT were again caught in the greatest numbers but of the 218 caught, 65.0% were released. Overall, in 2016, 69.5% of trout landed were released.

In 2016, anglers reported being less satisfied with their overall angling experience than the previous years (Tables 5). In 2016, anglers had a negative average angling experience response for the first time in six years' of surveys, which is an indication that the fishery may have provided an unsatisfactory experience. Anglers were satisfied with the size of trout over the six-year sampling period with the 2016 values higher than the previous years' averages. Anglers were neither satisfied nor unsatisfied with the number of trout caught in 2016 with the 2016 values lower than the previous years' averages.

Table 5. Angler satisfaction response averages for the Indian Creek Reservoir fishery from 2009, 2011-2013, and 2015 - 2016.

Year	Overall Angling experience	Size of the Fish	Number of Fish
2009, 2011-2013	1.43	1.03	1.01
2015	0.66	0.94	0.76
2016	-0.30	1.05	0.00

In 2016, approximately 48% anglers who reported their primary method or location fished were tube fishing, 33% fished from a boat, and 19% fished from shore/wading.

Discussion

Data gathered from the ICR ASB has shown anglers to have caught over two fish on average per trip, which is successful. Overall catch and CPUE in 2016 was the second and third highest in six years (n=270) (0.62 fish/hour). The decrease could be attributed to the lack of any RT stockings in 2016. In 2015 and 2016, California experienced a record drought in which American River Hatchery had to stock all of their fish by June to limit temperature-related fish losses at the hatchery.

The greatest number of LCT caught in 2016 were in the 16 - 17.9 in. size class, compared to 14 - 15.9 in. in 2015 (Ewing 2016). This could be due to the approximately 1800 sub-catchables planted in 2014 that have grown out to size. The greatest number of RT caught in 2016 were in the 12.0– 13.9 in. size class compared to the 10.0 – 11.9 in. size class in 2015. This corresponds with anglers being satisfied with the size of their catch and is higher than any previous year. It is possible that there is a sustainable balance between number of fish and available resources in ICR, thus allowing the trout that are in ICR to grow to larger sizes. The public was neither satisfied nor unsatisfied with the numbers of trout in 2016. This is a decrease from the previous five years' of surveys. This could be due to the lack of any catchable RT planted in 2016 because of the drought. CDFW has been stocking allotments of broodstock (2lbs) LCT from Heenan Lake (Alpine County) into ICR over recent years. However, anglers are not reporting catching many of these larger fish, as no LCT over 20 inches were caught and reported in 2016 and only three in 2015. The broodstock LCT could potentially be swimming downstream into the afterbay after they are stocked because they are stocked during their spawning season. CDFW will likely move the ICR broodstock allotment for 2018 to the East and West Carson River in hopes of giving the public an opportunity to catch a trophy-size fish since the afterbay is on private property. It is often difficult to manage a fishery to satisfy both high catch rates and large size of fish caught; arguably ICR has provided both large fish and high catch rates over the six years of this study.

Prior to 2015 the percentage of released species were very similar, ranging from 58.7% - 63.6%, but in 2015, 75.5% of the LCT were released compared to only 42.8% and 25.0% of RT and BN released, respectively. In 2016, 91.8% of LCT were released. It is unsure why such a high release percentage since the majority of LCT caught were 14 in. or greater. Determining if anglers preferred certain species of trout over another for human consumption could help explain the discrepancy in types of trout kept versus released. Every year's ASB survey shows that LCT are being released at a higher percentage than RT. Alpine County plants RT from a private aquaculturist in which their meat is a pink color and has been an angler favorite according to Alpine County (T. Sadaro, Pers. Communication). ICR also has a LMB population in which anglers have caught LMB over five pounds, but no LMB of any size were recorded being caught in 2016 (Figure 3). It is possible that LMB could be predated on RT and LCT but the actual percentage is unknown. In 2016, tube angling was the greatest method of angling recorded. This may be because that ICR has a lot of shoreline that is not conducive to shoreline angling and float tubes provide better angling access.



Figure 3. CDFW staff with LMB caught at ICR (M. Mamola).

The overall fishing experience for anglers in 2016 was negative at ICR for the first time during the six years of the study. It is unclear why overall angling experience was negative in 2016 since neither the number of fish or size of the fish had negative values. It is possible the lack of RT planted in 2016 may have played a role in the declined satisfaction or possibly the dissatisfaction has nothing to do with the

fishing itself but is instead due to outside factors such as weather, fishing access, conditions of fish caught, or crowds.

The number of respondents in the 2016 survey was 115, which is a fair number for an ASB. Ideally, the more respondents, the more feedback it provides CDFW on angler success at the fishery. It is essential CDFW maintain the trend of increasing angler participation in the ASB survey, as it provides information on complete fishing trips. CDFW staff should continue to notify anglers of the ASB locations at ICR, and how helpful angler participation in the survey is.

Both CDFW and Alpine County stock ICR. Rainbow trout are stocked by both entities while LCT are planted only by CDFW. The sizes of fish planted included fingerling, sub-catchable, catchable, and super-catchable (trophy) fish. Fingerling and sub-catchable trout are stocked under a put and grow management strategy while catchable and trophy trout are stocked under a put and take management strategy. CDFW is implementing a put and grow strategy with the sub-catchable LCT, and it appears that the fish are growing out to a catchable size, and showing up in large numbers. The majority of the LCT caught in 2016 were greater than 14 inches. Rapid growth is expected from the fingerling and sub-catchable size trout due to the high productivity of ICR. CDFW staff could better evaluate the success of stocked sub-catchable LCT by clipping the fins of all stocked trout prior to release in order to identify them in future surveys and get a better estimation of their yearly growth.

Indian Creek Reservoir is a very productive lake that has large amounts of weed cover during summer months, which can impede fishing success for shore anglers. It is difficult to identify any overlying trends for angling method since the 2016 survey was the first allowing the angler to indicate the method of fishing used.

Largemouth bass are present in ICR but have not shown up in the surveys. Largemouth bass have the potential to alter the fishery drastically, but it is hard to identify their effects without further studies. Electrofishing ICR by boat would help get a better understanding of the size of the LMB fishery and the possible presence of other warm water species.

Recommendations

- Broodstock LCT are not being reported in the ASB surveys in high numbers. Transfer broodstock allotment to the East and West Carson Rivers and monitor.
- Conduct a general fish survey to determine the relative population size of the LMB at ICR.
- Continue stocking efforts for RT and LCT.

References

1. Hood, N. 2013. Indian Creek Reservoir Creel Report. California Department of Fish and Wildlife. Region 2 Fish Files. Unpublished.
2. Ewing, B. 2016. Indian Creek Reservoir, Alpine County Summary Report of Roving Creel Surveys (2009, 2011 – 2013) and 2015 - 2016 Angler Survey Box Analysis at Indian Creek Reservoir, Alpine County.

